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Reply To: 3420 Date: JUL 26 1990

Subject: Dying Sugar Pine and Giant Sequoia in the Camp Creek Drainage, Arrowhead Ranger District (Report No. R90-10)

To: Forest Supervisor, San Bernardino National Forest

On July 11, 1990, Plant Pathologist Melissa Marosy and Entomologist John Dale visited the Camp Creek drainage area on the Arrowhead Ranger District of the San Bernardino National Forest with Forest Silviculturist Ernest Del Rio. The area was burned in the Bear Fire in the early 1970s, and was subsequently replanted with Jeffrey pine, sugar pine, and giant sequoia. Previous history of the area is unavailable, as is specific information regarding the regeneration effort.

The giant sequoia seem to have thrived on the site, outperforming both the sugar pine and the Jeffrey pine. In 1989, however, a general decline and eventual death of both giant sequoia and sugar pine was noted in the area. The harshness of the Camp Creek site and the lack of moisture in southern California during the past four years would suggest an abiotic basis for the observed symptoms. If this were the case, similar decline of giant sequoia in the future might be avoided by more careful site selection. If, however, a biotic agent were involved, the usefulness of giant sequoia as an alternate species in some areas might be in jeopardy. In light of these possibilities, Forest Pest Management was asked to conduct a biological evaluation to rule out any potential biotic agents which might explain the observed decline and death of both the giant sequoia and the sugar pine, and elucidate any possible relationship between the symptoms observed on these two species.

Numerous dead and dying giant sequoia ranging in size from 4 feet to 20 feet in height were observed. Two dead sugar pine approximately 10 feet in height were also observed. In addition, declining manzanita was noted on the site.

Insects which might have caused the decline and death of either species were not found. The root crown and lateral roots of several giant sequoia and one sugar pine were excavated, and signs of root disease were observed. Stringy rotten wood typical of that caused by the root disease organism Heterobasidion annosum was found in a 4-inch-DBH sugar pine. Necrotic tissue with limited decay starting midway on a lateral root and continuing up to the root crown area was found in one 6-inch-DBH fading giant sequoia. A definite margin between necrotic and healthy tissue was observed in both the root and root

crown areas. Some resin soaking of the affected tissue was observed. On other declining trees, no evidence of root disease was apparent in the root crown area or on those lateral roots which were readily excavated. Samples from both species were collected for closer laboratory examination.

The samples were incubated under moist conditions at 10 C for 10 days and then examined microscopically for signs of fungal infection. Fruiting bodies (positive identification) of the root disease fungus Heterobasidion annosum, cause of annosus root disease, were found on both sugar pine and giant sequoia wood samples.

Two "inter sterility groups" of Heterobasidion annosum are known to exist. The so-called P group has has been associated with naturally infected pines, incense-cedar, juniper, and manzanita. The 'S' group has been associated with true fir and giant sequoia. The two types are generally not found together on a given site. Thus, the situation which appears to exist in the Camp Creek area may be quite unique. We are coordinating further investigation of this situation with Bill Otrosina, Research Plant Pathologist at PSW-Berkeley, who will verify the intersterility groups of the fungi infecting the two species on the site. Further analysis of this situation will be provided to you as the results of Dr. Otrosina's investigations become available.

Questions regarding this report should be directed to Melissa Marosy (705-2640) or John Kliejunas (705-2571).

JOHN NEISESS, FPM Program Leader
State and Private Forestry

cc: District Ranger, Arrowhead Ranger District, San Bernardino National Forest, Ernest Del Rio, Forest Silviculturist, San Bernardino National Forest, William Otrosina, Research Plant Pahtologist, PSW Experiment Station

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